

## Claims

- [c1] 1. A system comprising an inertial body and a rotating shaft, in combination, the rotating shaft having a vibration characteristic that exhibits a bending mode and exhibits a breathing mode which are closely coupled, the bending mode and breathing mode being decoupled by attaching the inertial body to the rotating shaft proximate a bending vibration antinode to reduce the amplitude of the shaft vibrations.
- [c2] 2. A system according to claim 1, wherein the rotating shaft is a driveshaft.
- [c3] 3. A system according to claim 1, wherein the breathing mode is the expansion and contraction of the shaft excited by high frequency gear transmitted errors from either a transmission or an axle.
- [c4] 4. A system according to claim 1, wherein the bending mode is the oscillation of the shaft caused by the vibrations excited by high frequency gear transmitted errors from either a transmission or an axle.
- [c5] 5. A system according to claim 1, wherein the inertial body is attached to the rotating shaft proximate the

bending vibration antinode near the end thereof.

- [c6] 6. A system according to claim 1, wherein the inertial body is fixed to the rotating shaft using a press fit.
- [c7] 7. A system according to claim 1, wherein the inertial body is manufactured in two separate halves and affixed by clamping the two halves to the rotating shaft.
- [c8] 8. A driveshaft for torque transmission purposes especially for use in a drivetrain of a motor vehicle comprising:
  - a shaft having first and second ends and a central region;
  - an inertia ring having an inner opening fixed at a specified point on the driveshaft that separates the bending mode created by the vibrations of the driveshaft from the breathing mode created by the vibration of the driveshaft to reduce the amplitude of the resonant frequencies and limit the amount of noise emitted by the driveshaft.
- [c9] 9. A driveshaft according to claim 8, wherein the inertia ring is fixed at a bending antinode nearest one end of the driveshaft.
- [c10] 10. A driveshaft according to claim 8, wherein the outer diameter of the driveshaft is greater than the inner di-

ameter of the inertia ring so that the inertia ring may be press fit in place at a desired location corresponding to an antinode.

- [c11] 11. A driveshaft according to claim 8, wherein the inertia ring is securely fixed to the driveshaft and does not oscillate or vibrate independently from the driveshaft.
- [c12] 12. A driveshaft according to claim 8, wherein the inertia ring is rotationally symmetrical.
- [c13] 13. A driveshaft according to claim 8, wherein the weight of the inertia ring is determined by finite element analysis of the powertrain.
- [c14] 14. A driveshaft according to claim 8, wherein the inertia ring is made of aluminum.
- [c15] 15. A driveshaft according to claim 8, wherein the inertia ring is made of steel.
- [c16] 16. A driveshaft according to claim 8, wherein the weight of the inertia ring is determined by testing.
- [c17] 17. A drivetrain for a vehicle having an engine, transmission, differential and driveshaft connection wherein the driveshaft connection comprises:  
a shaft having first and second ends and a central region;

an inertia ring having an inner opening fixed at a specified point on the driveshaft that separates the bending mode created by the vibrations of the driveshaft from the breathing mode created by the rotation of the driveshaft to reduce the amplitude of the resonant frequencies and limit the amount of noise emitted by the driveshaft.

- [c18] 18. A drivetrain connection according to claim 17, wherein the inertia ring is fixed at an antinode.
- [c19] 19. A drivetrain connection according to claim 17, wherein the diameter of the driveshaft is greater than the inner diameter of the inertia ring so that the inertia ring may be press fit in place at a desired location corresponding to an antinode.
- [c20] 20. A drivetrain connection according to claim 17, wherein the inertia ring is securely fixed to the driveshaft and does not oscillate or vibrate independently from the driveshaft.